

## Disclaimer:

This English translation is produced by machine translation and may contain errors. The JPO, the NCIP, and those who drafted this document in the original language are not responsible for the result of the translation.

## Notes:

1. Untranslatable words are replaced with asterisks (\*\*\*\*).
2. Texts in the figures are not translated and shown as it is.

Translated: 15:18:25 JST 08/29/2005

Dictionary: Last updated 10/12/2004 / Priority:

## CLAIMS

## [Claim(s)]

[Claim 1] An oxidizer, a reducing agent, and the hypoviscosity chitosan characterized by not including a chitosan dialytic ferment substantially  
 [Claim 2] The hypoviscosity chitosan according to claim 1 whose viscosity is 5-50 or less mPa-c [Claim 3] The hypoviscosity chitosan according to claim 1 whenever [ deacetylation / whose ] is 85% or more [Claim 4] The manufacture method of the hypoviscosity chitosan according to claim 1 characterized by deacetylating the hypoviscosity chitin of 100 or less mPa-c by a dark alkaline water solution, and obtaining the hypoviscosity chitosan of 100 or less mPa-c [Claim 5] The manufacture method according to claim 4 that whenever [ deacetylation / of hypoviscosity chitosan ] is 85% or more [Claim 6] As a hypoviscosity chitin of 100 or less mPa-c, \*\*\*\* of the crustacea. The manufacture method of hypoviscosity chitosan according to claim 4 using the hypoviscosity chitin of 100 or less mPa-c obtained by processing the chitin which has \*\*\*\* of the crustacea or the viscosity of 200 or more mPa-c by which deprotein was carried out in dilute-acid solution of 50 degrees C or more

## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

## [0001]

[Industrial Application] The effect of the dietary fiber is expected from a chitin and chitosan by difficulty slaking property. Since chitosan adsorbs bile acid within an alimentary canal by having many amino groups and a serum cholesterol lowering operation is shown especially, the application to the functional food with which chitosan utilized the \*\* cholesterol operation will be expected from now on. Moreover, what has the specific molecular weight which is in the chitosan which carried out depolymerize shows antimicrobial activity, or anticancer activity is accepted. The object for industry, medical application, the object for food, and application in all fields are developed from now on, and hypoviscosity chitosan whose safety it is cheap and is high is desired. This invention relates to hypoviscosity chitosan and its manufacture method.

## [0002]

[Description of the Prior Art] [ manufacture of the conventional hypoviscosity chitin and hypoviscosity chitosan ] \*\*\*\* of the crustacea etc. — warming — [ decalcium processing is carried out with a hydrochloric acid aqueous solution in ordinary temperature, and a chitin is obtained, and ] after carrying out a deproteinization with rare alkali After deacetylating a chitin at 90-120 degrees C among strong alkali and manufacturing chitosan, the obtained chitosan Oxidizers, such as a hydrogen peroxide and perboric acid soda, Or the method of processing with reducing agents, such as an ascorbic acid, and the enzyme, for example, a protease, which decomposes chitosan. The method of processing with enzymes (these being named generically and it being called a chitosan dialytic ferment), such as sacroclastic enzyme, such as proteolytic enzyme, such as a papain, and a cellulase, or chitinase, and chitosanase, and manufacturing a hypoviscosity chitin and hypoviscosity chitosan is known.

## [0003]

[Problem to be solved by the invention] However, since those drugs are contained in the chitosan obtained in the top where the method of processing with an oxidizer, a reducing agent, and an enzyme has had productive efficiency, the safety is regarded as questionable. Especially as the manufacture method as an object for food, it was not desirable.

## [0004]

[Means for solving problem] Then, the result which this invention persons examined variously. [ that the hypoviscosity chitin of 100 or less mPa-c is obtained by processing the chitin which has \*\*\*\* of the crustacea or the viscosity of 200 or more mPa-c to which \*\*\*\*(ing) and the deprotein of the crustacea were carried out in dilute-acid solution of 50 degrees C or more, and the obtained hypoviscosity chitin ] It found out that the hypoviscosity chitosan of 100 or less mPa-c was obtained by carrying out deacetylation processing. Since it is easily obtained only by an acid and alkali treatment, its productive efficiency is high, and moreover, since the oxidizer, the reducing agent, any chitosan dialytic ferment, etc. are not being used for this invention, it is the high manufacture method of safety very much. This invention is completed based on the above-mentioned knowledge. That is, this invention relates to the hypoviscosity chitosan characterized by not including an oxidizer, a reducing agent, and a chitosan dialytic ferment, and its manufacture method on substance.

[0005] The hypoviscosity chitosan of this invention deacetylates in more detail the hypoviscosity chitin of 100 or less mPa-c obtained by processing the chitin which has \*\*\*\* of the crustacea or the viscosity of 200 or more mPa-c to which \*\*\*\*(ing) and the deprotein of the crustacea were carried out in dilute-acid solution of 50 degrees C or more by a dark alkaline water solution. It can obtain by considering it as the hypoviscosity chitosan of 100 or less mPa-c.

[0006] It is obtained by using a crab, a squilla, a shrimp, a krill, etc. as a raw material, obtaining it by carrying out the deprotein of it by a rare alkaline water solution as \*\*\*\* and the chitin of the crustacea where \*\*\*\*(ing) and the deprotein of the crustacea of the raw material in this invention were carried out, or carrying out decalcium with a dilute acid further. The class in particular of the grain size and crustacea is not limited. Moreover, after carrying out decalcium processing of the \*\*\*\* of the crustacea etc. previously, even if it carries out deprotein processing, it is obtained similarly, but it is more desirable to carry out manufacture top deprotein processing, and to carry out decalcium processing.

[0007] Although the processing temperature in the dilute-acid solution for obtaining the hypoviscosity chitin which is the raw material of this invention is good above 50 degrees C, 60 degrees C or more are desirable. Moreover, although the processing time changes with the grain size and calcium content of raw material to be used, and it is good in 0.5 to 10 hours, about 1 to 3 hours is desirable on productive efficiency. The thing of hypoviscosity is obtained, so that dilute-acid concentration is so high that the processing time is so long that processing temperature is high.

[0008] As dilute-acid solution, as long as it is dilute-acid solution, any are sufficient as a hydrochloric acid, a nitric acid, an acetic acid, a sulfuric acid, carbonic acid, oxalic acid, etc., but dilute-hydrochloric-acid solution is desirable, the concentration of an acid — 2-15 — about 3-10 w/w% is preferably good w/w%. Moreover, if the amount is an amount in which \*\*\*\* of the crustacea of raw material etc. is immersed, there will be no limit in particular, but about 5 to 20 times is desirable.

[0009] As for rinsing after processing in dilute-acid solution, fully washing is desirable. It is because molecular weight or viscosity falls further and

BEST AVAILABLE COPY

BEST AVAILABLE COPY

## JP,08-041106,A(1996) [CLAIM + DETAILED DESCRIPTION]

control of molecular weight or viscosity becomes instability, when washing is inadequate. Moreover, although there is possibility of the depolymerize only in this desiccation condition or hypoviscosity-izing, change of physical properties is not violently practical. [0010] In order to obtain the chitosan of hypoviscosity, 50-120 degrees C, when deacetylation reaction temperature and especially reaction time are made to react for 1 to 25 hours, they are [ that what is necessary is just to use a hypoviscosity chitin ] usually desirable [ they are the temperature of the range of 80 degrees C - 120 degrees C more preferably / it is desirable and / than 80 degrees C - 120 degrees C, and ], although not restricted.

[0011] A sodium hydroxide is desirable although alkaline water solutions, such as a sodium hydroxide and a potassium hydroxide, etc. are raised as a deacetylation agent, for example, the alkali concentration at the time of a reaction — 30-60 — about 45-55 w/w% is preferably good w/w%. Moreover, if the amount is an amount in which a chitin is immersed, there will be no limit in particular, but about 10 to 30 times is desirable.

[0012] Thus, as average molecular weight of the hypoviscosity chitosan of this invention obtained, it is tens of thousands - a 100,000 number, and as viscosity, it is 100 or less mPa-c, and is 5 - 50 mPa-c preferably. Whenever [ desirable deacetylation ] is 85% or more more preferably 80% or more.

[0013] As mentioned above, the very safe practicability of the hypoviscosity chitin of this invention and the manufacture method of hypoviscosity chitosan which does not contain an oxidizer, a reducing agent, any enzyme, etc. is high on substance. In addition, the measuring method of the viscosity of the measuring method of the average molecular weight of chitosan and a chitin, or chitosan used here is as follows. Moreover, measurement of whenever [ deacetylation ] adopted the colloidal titration method by a polyvinyl potassium sulfate solution.

[0014] [Measuring method of chitin viscosity] 0.6g of desiccation chitin samples are extracted to a 300ml beaker at accuracy, 300g of solutions (dimethylacetamide 100:8 lithium chloride) are added, and the churning dissolution is carried out for 24 hours. The temperature of the sample solution is held at 30±0.5 degrees C, and revolution viscosity (mPa-c) is measured by 30 revolutions using a Brookfield viscometer.

[0015] [Measuring method of chitosan viscosity] 1.5g of desiccation chitosan samples are extracted to a 300ml beaker at accuracy, after adding and agitating 297g of pure water and distributing a sample, 1.5g of acetic acids are added and the churning dissolution is carried out for 2 hours. The temperature of the sample solution is held at 20±0.5 degrees C, and revolution viscosity (mPa-c) is measured by 30 revolutions using a Brookfield viscometer.

[0016] [Measuring method of chitosan average molecular weight] A calibration curve is created using a pull run molecular weight standard. The molecular weight of the solution which dissolved chitosan by the eluate is measured. The column used the hydrogen GPC column.

[0017]

[Working example] Although an example is given to below and this invention is concretely explained to it, this invention is not limited to these.

[0018] 100g of husks of the snow crab of 2-8 meshes by which example 1 deprotein was carried out were thrown into 600g of 5 w/w% hydrochloric acids, at 50 degrees C, it agitated for 5 hours and decalcium processing was carried out. The obtained chitin was filtered, and it rinsed enough, and dried, and Chitin 23.6g was obtained. The viscosity of the obtained chitin was 63 mPa-c.

[0019] 200g of desiccation husks of the snow crab of 210-20 meshes of examples were thrown into 1.3kg of 6 w/w% hydrochloric acids, at 70 degrees C, it agitated for 10 hours and decalcium processing was carried out. After carrying out deprotein processing of the obtained chitin at 80 degrees C by a sodium hydroxide 8% for 2 hours, it filtered, and it rinsed enough, and dried and Chitin 41.0g was obtained. The viscosity of the obtained chitin was 34 mPa-c.

[0020] 100g of husks of the snow crab of 10-20 meshes by which example 3 deprotein was carried out were thrown into 600g of 9 w/w% hydrochloric acids, at 70 degrees C, it agitated for 3 hours and decalcium processing was carried out. The obtained chitin was filtered, and it rinsed enough, and dried, and Chitin 24.2g was obtained. The viscosity of the obtained chitin was 13 mPa-c.

[0021] Non-ground chitin 100kg of example 4 viscosity 800 mPa-c was supplied to 600kg of 3 w/w% hydrochloric acids, at 80 degrees C, it agitated for 2 hours and re-decalcium processing was carried out. The obtained chitin was filtered, and it rinsed enough, and dried, and chitin 99.2kg was obtained. The viscosity of the obtained chitin was 39 mPa-c.

[0022] Every 5g each of desiccation chitins obtained in the example 5 example 1-4 were extracted, and 120g of 50 w/w% sodium hydroxide solutions were added, and at 110 degrees C, it reacted for 3 hours and deacetylated. The obtained chitosan was filtered, and it rinsed, and dried and chitosan was obtained. Whenever [ weight / of the obtained chitosan / and deacetylation ], and viscosity were as in a table 1.

[0023]

[Table 1]

Table 1 Example No Chitin Viscosity Whenever [ deacetylation ] Chitosan weight Chitosan viscosity Chitosan average molecular weight (mPa and c) (%) (g) (mPa and c) 1 63 93.6 39.8 31 280,000 2 34 94.7 39.4 18 150,000 3 13 94.9 39.9 6 50,000 4 39 92.0 40.5 20 180,000 [0024] = Every 5g each of hypoviscosity chitins obtained in the example 6 example 1-4 were extracted, and 150g of 45 w/w% sodium hydroxide solutions were added, and at 90 degrees C, it reacted for 12 hours and deacetylated. The obtained chitosan was filtered, and it rinsed, and dried and chitosan was obtained. Whenever [ weight / of the obtained chitosan / and deacetylation ], and viscosity were as in a table 2.

[0025]

[Table 2]

Table 2 Example No Chitin Viscosity Whenever [ deacetylation ] Chitosan weight Chitosan viscosity Chitosan average molecular weight (mPa and c) (%) (g) (mPa and c) 1 63 94.3 39.6 62 580,000 2 34 95.0 39.5 37 330,000 3 13 95.9 39.0 22 190,000 4 39 94.0 40.8 41 380,000 [0026] = Every 10g each of chitins obtained in the example 7 example 1-4 were extracted, and 200g of 48 w/w% sodium hydroxide solutions were added, and at 65 degrees C, it reacted for 20 hours and deacetylated. The obtained chitosan was filtered, and it rinsed, and dried and chitosan was obtained. Whenever [ weight / of the obtained chitosan / and deacetylation ], and viscosity were as in a table 3.

[0027]

[Table 3]

Table 3 Example No Chitin Viscosity Whenever [ deacetylation ] Chitosan weight Chitosan viscosity Chitosan average molecular weight (mPa and c) (%) (g) (mPa and c) 1 63 89.3 39.9 84 710,000 2 34 90.5 39.3 69 640,000 3 13 91.2 39.6 29 220,000 4 39 88.0 40.2 53 460,000 [0028] = According to this invention, hypoviscosity chitosan with high safety which does not contain an oxidizer, a reducing agent, and any chitosan dialytic ferment is obtained efficiently, and the application expansion of it in all the fields for food etc. is attained especially.

[Translation done.]

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平8-41106

(43) 公開日 平成8年(1996)2月13日

(51) Int.Cl.<sup>6</sup>

C 0 8 B 37/08

識別記号

庁内整理番号

A 7433-4C

F I

技術表示箇所

審査請求 未請求 請求項の数 6 F D (全 4 頁)

(21) 出願番号

特願平6-193781

(22) 出願日

平成6年(1994)7月27日

(71) 出願人 000004086

日本化薬株式会社

東京都千代田区富士見1丁目11番2号

(72) 発明者 亀山 博

東京都北区志茂3-17-1-102

(72) 発明者 関口 忠雄

埼玉県浦和市辻5-9-26-302

(72) 発明者 佐藤 亮

東京都保谷市下保谷2-7-21-205

(54) 【発明の名称】 低粘度キトサン及びその製造方法

(57) 【要約】

【目的】 本発明は、甲殻類の甲皮及び脱タンパクされた甲殻類の甲皮又は200mPa・c以上の粘度を有するキチンを50℃以上の希酸水溶液で処理することで100mPa・c以下の低粘度キチンを得、更に脱アセチル化することを特徴とする酸化剤、還元剤及びキトサン分解酵素を実質的に含まない100mPa・c以下の低粘度キトサン及びその製造方法

【効果】 酸、アルカリ以外の他薬剤を一切使用しないので、安価で極めて安全性の高い低粘度キトサンが容易に製造できることにより、特に食品用として、他に工業用、医療用とあらゆる分野での応用展開が可能となる。

BEST AVAILABLE COPY

1

## 【特許請求の範囲】

【請求項1】 酸化剤、還元剤、及びキトサン分解酵素を実質的に含まないことを特徴とする低粘度キトサン

【請求項2】 粘度が5～50mPa・c以下である請求項1記載の低粘度キトサン

【請求項3】 脱アセチル化度が85%以上である請求項1記載の低粘度キトサン

【請求項4】 100mPa・c以下の低粘度キチンを濃アルカリ水溶液で脱アセチル化し、100mPa・c以下の低粘度キトサンを得ることを特徴とする請求項1記載の低粘度キトサンの製造方法

【請求項5】 低粘度キトサンの脱アセチル化度が85%以上である請求項4記載の製造方法

【請求項6】 100mPa・c以下の低粘度キチンとして、甲殻類の甲皮、脱タンパクされた甲殻類の甲皮または200mPa・c以上の粘度を有するキチンを50℃以上の希酸水溶液で処理して得られる100mPa・c以下の低粘度キチンを用いる請求項4記載の低粘度キトサンの製造方法

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 キチン及びキトサンは難消化性により食物繊維の効果が期待されている。中でもキトサンは多くのアミノ基をもつことにより、消化管内で胆汁酸を吸着し、血清コレステロール低下作用を示すことから、今後キトサンは降コレステロール作用を活用した機能性食品への応用が期待されている。又、低分子化したキトサンの中である特定の分子量を有するものが抗菌力を示したり、抗癌活性が認められている。今後は、工業用、医療用、食品用とあらゆる分野での応用が展開され、安価で安全性の高い低粘度キトサンが望まれている。本発明は低粘度キトサン及びその製造方法に関する。

## 【0002】

【従来の技術】 従来の低粘度キチン及び低粘度キトサンの製造は、甲殻類の甲皮等を加温希アルカリで除タンパクした後、常温で塩酸水溶液で脱カルシウム処理してキチンを得、キチンを強アルカリ中90～120℃で脱アセチル化してキトサンを製造した後、得られたキトサンを過酸化水素、過ホウ酸ソーダ等の酸化剤、又は、アスコルビン酸等の還元剤で処理する方法、及び、キトサンを分解する酵素例えばプロテアーゼ、パバイン等のタンパク分解酵素、セルラーゼ等の糖分解酵素あるいはキチナーゼ、キトサナーゼ等の酵素（これらを総称してキトサン分解酵素という）で処理して低粘度キチン及び低粘度キトサンを製造する方法が知られている。

## 【0003】

【発明が解決しようとする課題】 しかし、酸化剤や還元剤及び酵素で処理する方法は、生産効率が悪い上に、得られたキトサン中にそれらの薬剤が含まれるため、その

2

安全性が疑問視されている。特に、食品用としての製造方法としては好ましくなかった。

## 【0004】

【課題を解決するための手段】 そこで本発明者らは種々検討した結果、甲殻類の甲皮及び脱タンパクされた甲殻類の甲皮又は200mPa・c以上の粘度を有するキチンを50℃以上の希酸水溶液で処理することで100mPa・c以下の低粘度キチンが得られることおよび得られた低粘度キチンを脱アセチル化処理することで100mPa・c以下の低粘度キトサンが得られることを見いだした。本発明は、酸及びアルカリ処理のみで容易に得られるので生産効率がよく、しかも、酸化剤、還元剤、及びキトサン分解酵素等を一切使用していないので極めて安全性の高い製造方法である。本発明は上記知見に基づいて完成されたものである。即ち、本発明は実質上、酸化剤、還元剤及びキトサン分解酵素を含まないことを特徴とする低粘度キトサン及びその製造方法に関する。

【0005】 より詳しくは、本発明の低粘度キトサンは、甲殻類の甲皮及び脱タンパクされた甲殻類の甲皮又は200mPa・c以上の粘度を有するキチンを50℃以上の希酸水溶液で処理して得られる100mPa・c以下の低粘度キチンを濃アルカリ水溶液で脱アセチル化し、100mPa・c以下の低粘度キトサンとすることにより得ることができる。

【0006】 本発明における原材料の甲殻類の甲皮及び脱タンパクされた甲殻類の甲皮及びキチンとしては、蟹、シャコ、海老、オキアミ等を原料とし、それを希アルカリ水溶液で脱蛋白して得るか、更に希酸で脱カルシウムすることによって得られる。その粒度及び甲殻類の種類は特に限定するものではない。又、甲殻類の甲皮等を先に脱カルシウム処理した後、脱タンパク処理しても同様に得られるが製造上脱タンパク処理して脱カルシウム処理の方が好ましい。

【0007】 本発明の原料である低粘度キチンを得るための希酸水溶液での処理温度は50℃以上でよいが、60℃以上が好ましい。又、処理時間は使用する原材料の粒度及びカルシウム含有量により異なるが、0.5～10時間程度でよいが、生産効率上1～3時間程度が好ましい。処理温度が高い程、また処理時間が長い程、また希酸濃度が高い程、低粘度のものが得られる。

【0008】 希酸水溶液としては、希酸水溶液であれば塩酸、硝酸、酢酸、硫酸、炭酸、蔞酸等いずれでも良いが希塩酸水溶液が好ましい。酸の濃度は2～15w/w%、好ましくは3～10w/w%程度がよい。又、その量は、原材料の甲殻類の甲皮等が浸る量であれば特に制限は無いが、5～20倍程度が好ましい。

【0009】 希酸水溶液での処理後の水洗は充分に洗浄することが望ましい。なぜなら、洗浄が不十分な場合、更に分子量又は粘度が低下して分子量又は粘度のコントロールが不安定になるからである。又、この乾燥条件の

みでの低分子化又は低粘度化の可能性はあるが物性の変動が激しく実用的ではない。

【0010】低粘度のキトサンを得るには、低粘度キチンを使用すればよく、脱アセチル化反応温度と反応時間は、特に制限されないが通常50～120℃、好ましくは80℃～120℃より好ましくは90℃～120℃の範囲の温度で、1～25時間反応させると好ましい。

【0011】脱アセチル化剤としては、例えば水酸化ナトリウム、水酸化カリウム等のアルカリ水溶液などがあげられるが、水酸化ナトリウムが好ましい。反応時のアルカリ濃度は30～60w/w%、好ましくは45～55w/w%程度がよい。又、その量は、キチンが浸る量であれば特に制限は無いが、10～30倍程度が好ましい。

【0012】このようにして得られる本発明の低粘度キトサンの平均分子量としては、数万～数十万であり、また、粘度としては、100mPa・c以下であり、好ましくは5～50mPa・cである。好ましい脱アセチル化度は80%以上、より好ましくは85%以上である。

【0013】以上から本発明の低粘度キチン及び低粘度キトサンの製造方法は実質上、酸化剤、還元剤、酵素等を一切含まない極めて安全な実用性の高いものである。尚、ここで用いるキトサンの平均分子量の測定方法及びキチン又はキトサンの粘度の測定方法は下記の通りである。又、脱アセチル化度の測定は、ポリビニル硫酸カリウム溶液によるコロイド滴定法を採用した。

【0014】【キチン粘度の測定方法】300mlビーカーに乾燥キチン試料0.6gを正確に採取し、溶解液（ジメチルアセトアミド100：8塩化リチウム）300gを加えて24時間攪拌溶解する。試料溶液の温度を30±0.5℃に保持し、B型粘度計を用いて30回転で回転粘度（mPa・c）を測定する。

【0015】【キトサン粘度の測定方法】300mlビーカーに乾燥キトサン試料1.5gを正確に採取し、純水297gを加えて攪拌し試料を分散した後、酢酸1.5gを添加して2時間攪拌溶解する。試料溶液の温度を20±0.5℃に保持し、B型粘度計を用いて30回転で回転粘度（mPa・c）を測定する。

【0016】【キトサン平均分子量の測定方法】プルラン分子量標準を用い検量線を作成する。キトサンを溶解

\*液で溶解した溶液の分子量を測定する。カラムは水素GPCカラムを用いた。

【0017】

【実施例】以下に実施例を挙げて本発明を具体的に説明するが、本発明はこれらに限定されるものではない。

【0018】実施例1

脱タンパクされた2～8メッシュのズワイ蟹の殻100gを、5w/w%塩酸600gに投入し50℃で5時間攪拌して脱カルシウム処理した。得られたキチンを濾過し、充分水洗して乾燥しキチン23.6gを得た。得られたキチンの粘度は63mPa・cであった。

【0019】実施例2

10～20メッシュのズワイ蟹の乾燥殻200gを、6w/w%塩酸1.3kgに投入し70℃で1.0時間攪拌して脱カルシウム処理した。得られたキチンを8%水酸化ナトリウムで80℃で2時間脱タンパク処理した後、濾過し、充分水洗して乾燥しキチン41.0gを得た。得られたキチンの粘度は34mPa・cであった。

【0020】実施例3

脱タンパクされた10～20メッシュのズワイ蟹の殻100gを、9w/w%塩酸600gに投入し70℃で3時間攪拌して脱カルシウム処理した。得られたキチンを濾過し、充分水洗して乾燥しキチン24.2gを得た。得られたキチンの粘度は13mPa・cであった。

【0021】実施例4

粘度800mPa・cの未粉碎キチン100kgを、3w/w%塩酸600kgに投入し60℃で2時間攪拌して再脱カルシウム処理した。得られたキチンを濾過し、充分水洗して乾燥しキチン99.2kgを得た。得られたキチンの粘度は39mPa・cであった。

【0022】実施例5

実施例1～4で得られた乾燥キチンを各5gずつ採取し、50w/w%水酸化ナトリウム溶液120gを加えて110℃で3時間反応して脱アセチル化した。得られたキトサンを濾過、水洗、乾燥し、キトサンを得た。得られたキトサンの重量、脱アセチル化度及び粘度は表1の通りであった。

【0023】

【表1】

表1

実施例No	キチン 粘度 (mPa・c)	脱アセチル化度 (%)	キトサン重量 (g)	キトサン粘度 (mPa・c)	キトサン平均分子量
1	63	93.6	39.8	31	28万
2	34	94.7	39.4	18	15万
3	13	94.9	39.9	6	5万
4	39	92.0	40.5	20	18万

【0024】実施例6

実施例1～4で得られた低粘度キチンを各5gずつ採取し、45w/w%水酸化ナトリウム溶液150gを加え

て90℃で12時間反応して脱アセチル化した。得られたキトサンを濾過、水洗、乾燥し、キトサンを得た。得られたキトサンの重量、脱アセチル化度及び粘度は表2

の通りであった。

【0025】

\*【表2】

\*

表2

実施例No	キチン粘度 (mPa・c)	脱アセチル化度 (%)	キトサン重量 (g)	キトサン粘度 (mPa・c)	キトサン平均分子量
1	63	94.3	39.6	62	58万
2	34	95.0	39.5	37	33万
3	13	95.9	39.0	22	19万
4	39	94.0	40.8	41	38万

【0026】実施例7

10※たキトサンの重量、脱アセチル化度及び粘度は表3の通

実施例1～4で得られたキチンを各10gずつ採取し、  
48w/w%水酸化ナトリウム溶液200gを加えて6  
5℃で2.0時間反応して脱アセチル化した。得られたキ  
トサンを濾過、水洗、乾燥し、キトサンを得た。得られ※

りであった。

【0027】

【表3】

表3

実施例No	キチン粘度 (mPa・c)	脱アセチル化度 (%)	キトサン重量 (g)	キトサン粘度 (mPa・c)	キトサン平均分子量
1	63	89.3	39.9	84	71万
2	34	90.5	39.3	69	64万
3	13	91.2	39.6	29	22万
4	39	88.0	40.2	53	46万

【0028】本発明によれば、酸化剤・還元剤及びキト  
サン分解酵素を一切含まない安全性の高い低粘度キトサ

ンが効率良く得られ、特に食品用等のあらゆる分野での  
応用展開が可能となる。

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** \_\_\_\_\_

**BEST AVAILABLE COPY**

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**

**BEST AVAILABLE COPY**